INNOLUX DISPLAY CORPORATION

TM315GW01 V.0 LCD OPEN CELL SPECIFICATION

( ) Preliminary Specification

(●) Final Specification

Approved by	*Checked by*	*Prepared by*

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Document Number: TM315GW01 V.0-DR5

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Department		Prepared by	Checked by
MKT			
TD			
PD	EE		
	ME		
RA			

Innolux Display Corporation

Document Number: TM315GW01 V.0-DR5

Version: 1.2

Record of Revision

Version	Revise Date	Page	Content
1.0	2011/5/5	All	First edition to all Spec.
1.1	2011/6/14	6	Update LVDS connector supplier part number
1.2	2011/6/14	19~21	Update label and packing

Contents:

A. General specification

1. OVERVIEW

TM315GW01 V.0 is a 31.5" TFT Liquid Crystal Display open cell. This open cell supports 1366 x 768 WXGA format and can display true 16.7M colors (8-bit).

2. CHARACTERISTICS

CHARACTERISTICS ITEMS	SPECIFICATIONS
Screen size (in)	31.5
Pixel (lines)	1366X 768
Active area (mm)	697.685 (H) X 392.256(V) (31.5")
Sub - Pixel pitch (mm)	0.17025 (H) X 0.51075 (V)
Color configuration	R, G, B vertical stripe
Weight (g)	1180
Physical Size (mm)	716.0 (H) X 414.4 (W) X1.83 (D) Typ.
Display Mode	Transmissive mode/Normally black
Contrast Ratio	(3000:1) Typ. (Typical value measure at INL's module)
Glass thickness (Array/CF) (mm)	0.7 / 0.7
Viewing Angle (CR>10)	+89/-89(H), +89/-89(V) Typ. (Typical value measure at INL's module)
Color Chromaticity	R= 0.647, 0.337 G= 0.292, 0.600 B= 0.138, 0.091 W= 0.317, 0.338 (With C source)
Cell Transparency (%)	4.62%Typ. (Typical value measure at INL's module)
Polarizer (CF side)	F9, Anti-glare coating, 707.8(H)x407.7(W) Hardness:3H
Polarizer (TFT side)	F9, Anti-glare coating, 706.5(H)x407.2(W)

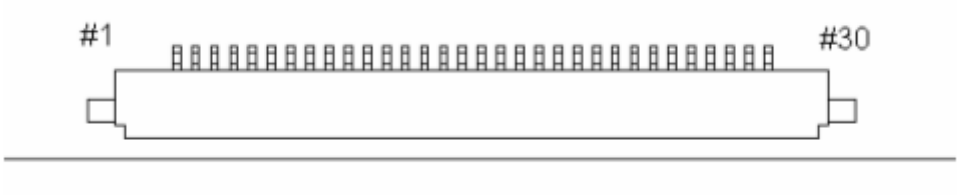
B. Electrical specifications

1. Pin assignment

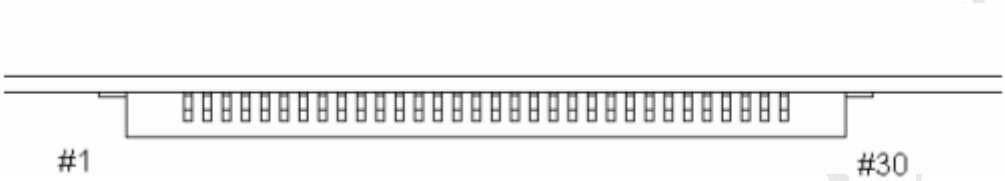
Connector

FOXCONN GS23302-1311S-7F or mechanical interface equivalent connector.

Pin No	Symbol	Description
1	VCC	+12V, DC, Regulated
2	VCC	+12V, DC, Regulated
3	VCC	+12V, DC, Regulated
4	VCC	+12V, DC, Regulated
5	GND	Ground and Signal Return
6	GND	Ground and Signal Return
7	GND	Ground and Signal Return
8	GND	Ground and Signal Return
9	LVDS Option	Low/Open for Normal (NS), High for JEIDA
10	Reserved	Open
11	GND	Ground and Signal Return for LVDS
12	RIN0-	LVDS Channel 0 negative
13	RIN0+	LVDS Channel 0 positive
14	GND	Ground and Signal Return for LVDS
15	RIN1-	LVDS Channel 1 negative
16	RIN1+	LVDS Channel 1 positive
17	GND	Ground and Signal Return for LVDS
18	RIN2-	LVDS Channel 2 negative
19	RIN2+	LVDS Channel 2 positive
20	GND	Ground and Signal Return for LVDS
21	RCLK-	LVDS Clock negative
22	RCLK+	LVDS Clock positive
23	GND	Ground and Signal Return for LVDS
24	RIN3-	LVDS Channel 3 negative
25	RIN3+	LVDS Channel 3 positive
26	GND	Ground and Signal Return for LVDS
27	Reserved	Open or High
28	Reserved	Open or High
29	GND	Ground and Signal Return
30	GND	Ground and Signal Return



Top view of LVDS connector



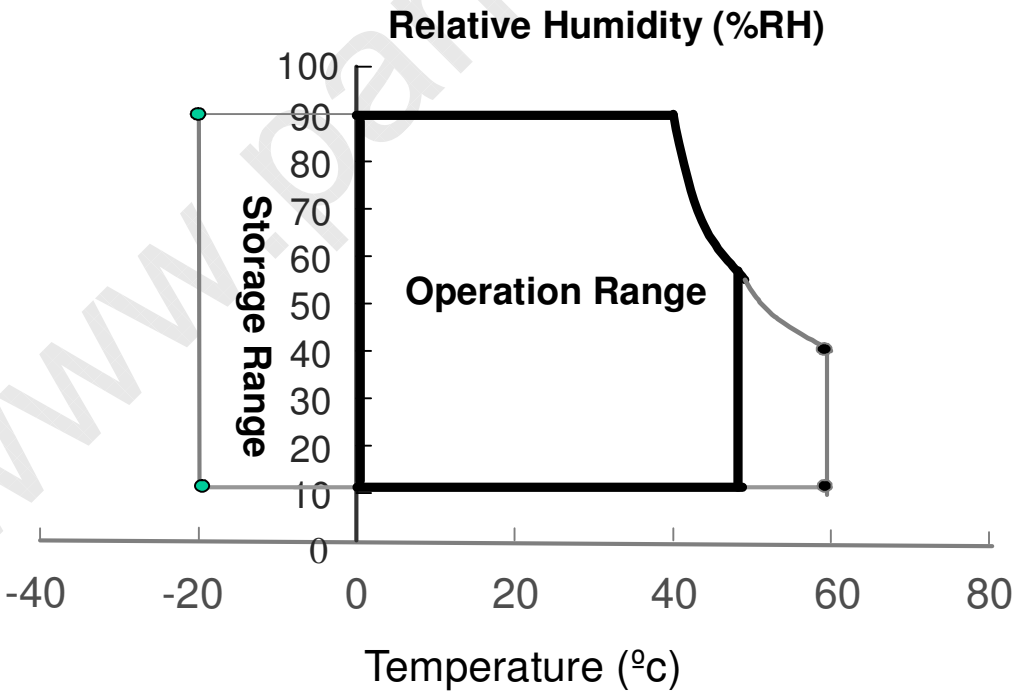
Rear view of LVDS connector

2. Absolute maximum ratings

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LCD drive voltage	V_{cc}	-0.3	-	14.0	V	At 25℃
Input signal voltage	V_{LH}	-0.3	-	3.6	V	At 25℃
BLU Input voltage	VDDB	-0.3	-	28	V	At 25℃
Operating temperature	Top	0	-	50	℃	Note 1
Operating Humidity	Hop	10	-	90	%RH	
Storage temperature	T_{ST}	-20	-	60	℃	Note 2
Storage Humidity	H_{ST}	10	-	90	%RH	

Note 1: The relative humidity must not exceed 90% non-condensing at temperatures of 40℃ or less. At temperatures greater than 40℃, the wet bulb temperature must not exceed 39℃.

Note 2: The unit should not be exposed to corrosive chemicals.



3. Electrical characteristics

a. Typical operating conditions

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
LCD Input Voltage		V_{cc}	10.8	12	13.2	V	
LCD Permissive Power Input Ripple		V_{RF}	-	-	0.4	V	
LCD Input Current	Black	I_{cc}	-	300	400	mA	Note 1
	White	I_{cc}	-	450	550		Note 2
	Mosaic	I_{cc}	-	375	475		Note 3
Power Consumption		Pc	-	5.4	7.26	W	Note 2
LCD Rush Current		I_{Rush}	-	-	3	A	Note 4
Logic Input Voltage LVDS: IN+, IN-	Common Mode Voltage	VCM	1.10	1.25	1.40	V	
	Differential Input Voltage	VID	100	-	600	mV	
	Threshold Voltage (High)	VTH	-	-	100	mV	Note 5
	Threshold Voltage (Low)	VTL	-100	-	-	mV	Note 5

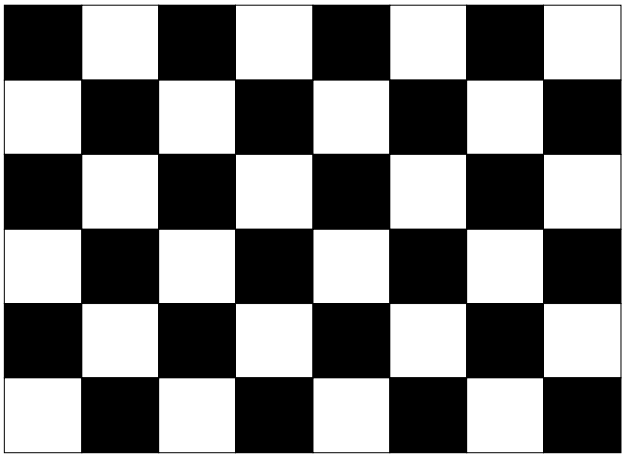
Note 1 : The specified current is under the Vcc =12V, 25 ℃, fv=60Hz (frame frequency) condition whereas black pattern is displayed.

Note 2 : The specified current is under the Vcc =12V, 25 ℃, fv=60Hz (frame frequency) condition whereas white pattern is displayed.

Note 3 : The specified current is under the Vcc =12V, 25 ℃, fv=60Hz (frame frequency) condition whereas mosaic pattern(black & white [8*6]) is displayed.

White : 255 Gray

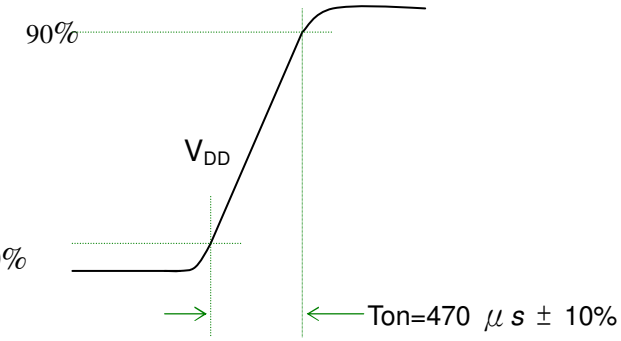
Black : 0 Gray



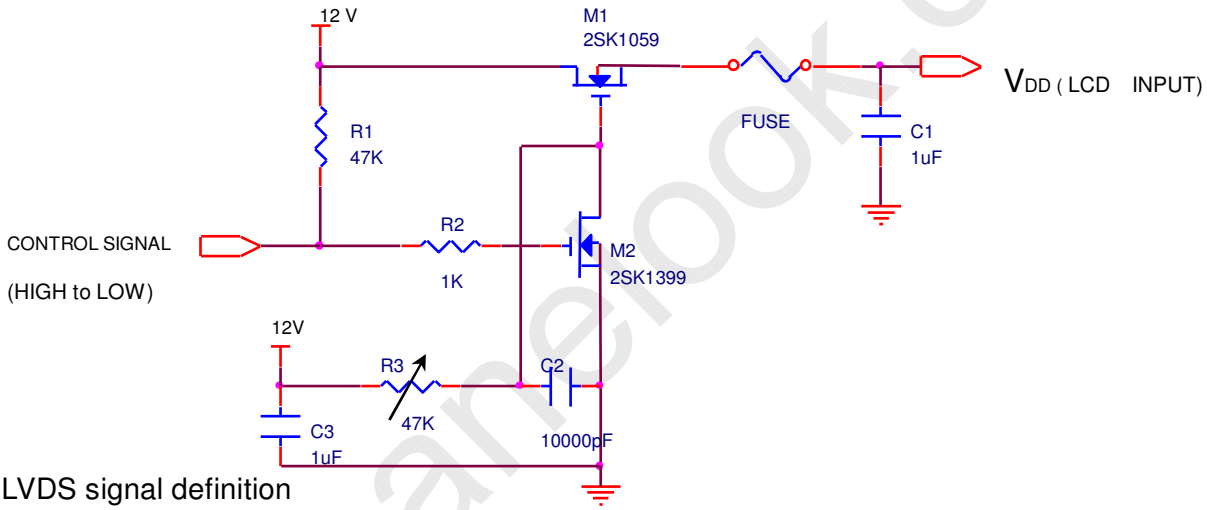
Note 4 : test condition :'

(1) V_{DD} = 12 V, V_{DD} rising time = 470 μs ± 10%

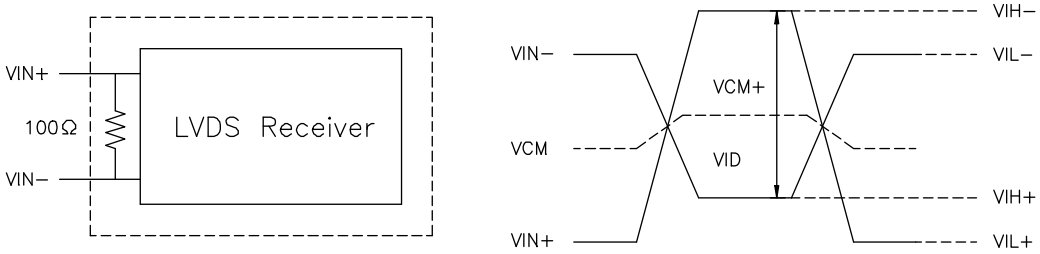
(2) Pattern: Mosaic pattern



(3) Test circuit



Note 5: LVDS signal definition



VIN_+ = Positive differential DATA & CLK Input

VIN- = Negative differential DATA & CLK Input

VID = VIN_+ – VIN- ,

ΔVCM = | VCM_+–VCM- | ,

ΔVID = | VID_+–VID- | ,

VID+ = | VIH_+–VIH- | ,

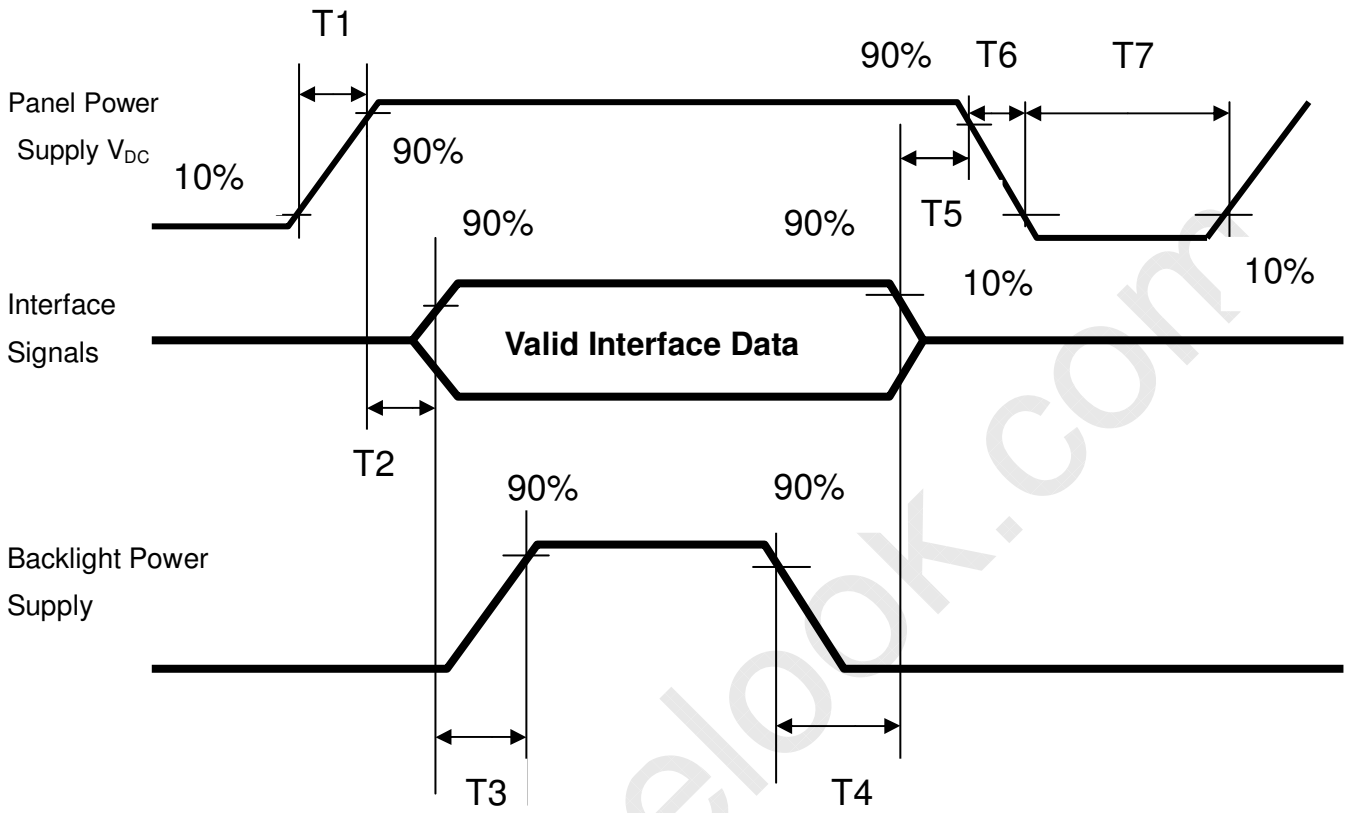
VID- = | VIL_+–VIL- | ,

VCM = (VIN_+ +VIN-)/2,

VCM+ = (VIH_+ +VIH-)/2,

VCM- = (VIL_+ +VIL-)/2,

Note 6 : Power on sequence for LCD V_{DD}



Parameter	Value			Unit
	Min	Typ	Max	ms
T1	0.1	-	30	ms
T2	0.1	-	50	ms
T3	200	-	-	ms
T4	10	-	-	ms
T5	0.1	-	50	ms
T6		-	300	ms
T7	500	-	-	ms

b. Display color vs. input data signals

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Color		Input color data																							
		Red								Green								Blue							
		MSB							LSB	MSB							LSB	MSB							LSB
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Red(000) dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(002)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255) bright	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(000)dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Blue(000) dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Blue(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255) bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

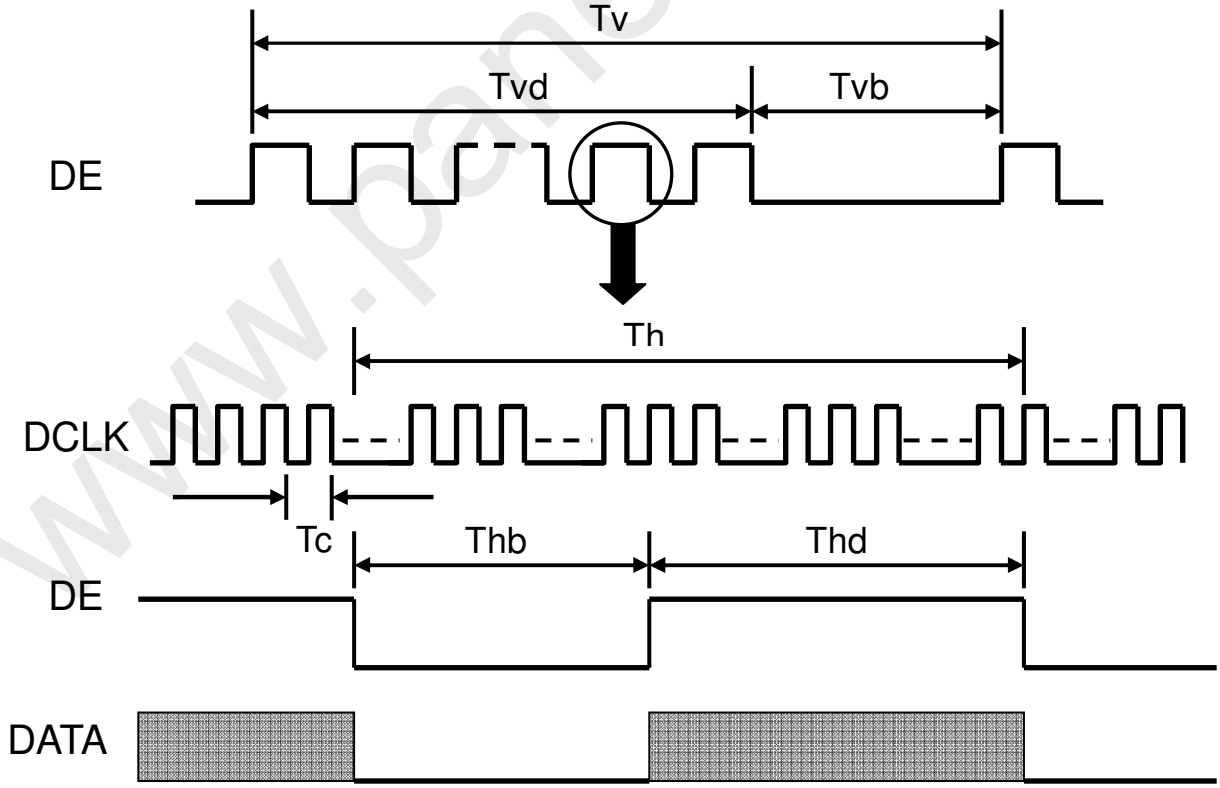
c. Input signal timing

Support Input Timing Table

	Item	Description	Min.	Typ.	Max.	Unit
Clock	Dclk	period	11.63	12.5	20	nS
		frequency	50	80	86	MHz
Vertical	T_{V_TOTAL}	V total line number	776	810	1015	T_{H_TOTAL}
	T_{V_DATA}	Data duration	—	768	—	T_{H_TOTAL}
	T_{VB}	V-blank	8	42	247	T_{H_TOTAL}
	f_V	frequency	47	60	63	Hz
Horizontal	T_{H_TOTAL}	H total pixel number	1503	1648	2000	DClk
	T_{H_DATA}	Data duration	—	1366	—	DClk
	T_{HB}	H-blank	137	282	634	DClk

Note: Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low Logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM



d. Display Position

D(1, 1)	D(2, 1)	.....	D(683, 1)	.....	D(1365, 1)	D(1366, 1)
D(1, 2)	D(2, 2)	.....	D(683, 2)	.....	D(1365, 2)	D(1366, 2)
⋮		.....	⋮	.....	⋮	⋮
D(1, 384)	D(2, 384)	.....	D(683, 384)	.....	D(1365, 384)	D(1366, 384)
⋮		.....	⋮	.....	⋮	⋮
D(1, 767)	D(2, 767)	.....	D(683, 767)	.....	D(1365, 767)	D(1366, 767)
D(1, 768)	D(2, 768)	.....	D(683, 768)	.....	D(1365, 768)	D(1366, 768)

C. Optical specifications

Item	Symbol	Condition	Specification			Unit	Remark
			Min.	Typ.	Max.		
G to G Response time with INL's Module	Tγ	θ= 0°	-	8.5	14	ms	Note 2
Contrast ratio with INL's Module	CR	θ= 0°	2400	3000	-		Note 1,3
Viewing angle with INL's Module	Top	CR≧10	-	89	-	deg.	Note 1,3,5
	Bottom	CR≧10	-	89	-		
	Left	CR≧10	-	89	-		
	Right	CR≧10	-	89	-		
Cell Transparency (%) with INL's Module	Tr	Center	-	4.62	-	%	Note 1,4
Color chromaticity(CIE) With C-Light	Wx	θ= 0°	-0.03	0.317	+0.03		Note 0
	Wy			0.338			
	Rx			0.647			
	Ry			0.337			
	Gx			0.292			
	Gy			0.600			
	Bx			0.138			
	By			0.091			
White uniformity (9 points) with INL's Module	δ_W		-	-	1.3		Note 1,6
Cross talk with INL's Module	Ct		-	-	2%		Note 7

Note 0 : Light source is the standard light source "C" which is defined by CIE and driving voltages are based on suitable gamma voltages. The calculating method is as following :

1. Measure Module's and BLU's spectrums. White is without signal input and R, G, B are with signal input BLU is supplied by INL.
2. Calculate cell's spectrum.
3. Calculate cell's chromaticity by using the spectrum of standard light source "C"

Note 1: 1. Ambient temperature = 25℃.
2. To be measured in dark room after backlight warm up 30 minutes.
3. To be measured with a viewing cone of 2°by Topcon luminance meter BM-5A.

Note 2: G to G Response Time:
Response time Tγ is the average time required for display transition by switching the input signal for six luminance ratio (0%,20%,40%,60%,80%,100% brightness matrix) and is based
on fv=60Hz to optimize.

	0%	20%	40%	60%	80%	100%
0%		t0%-20%	t0%-40%	t0%-60%	t0%-80%	t0%-100%
20%	t20%-0%		t20%-40%	t20%-60%	t20%-80%	t20%-100%
40%	t40%-0%	t40%-20%		t40%-60%	t40%-80%	t40%-100%
60%	t60%-0%	t60%-20%	t60%-40%		t60%-80%	t60%-100%
80%	t80%-0%	t80%-20%	t80%-40%	t80%-60%		t80%-100%
100%	t100%-0%	t100%-20%	t100%-40%	t100%-60%	t100%-80%	

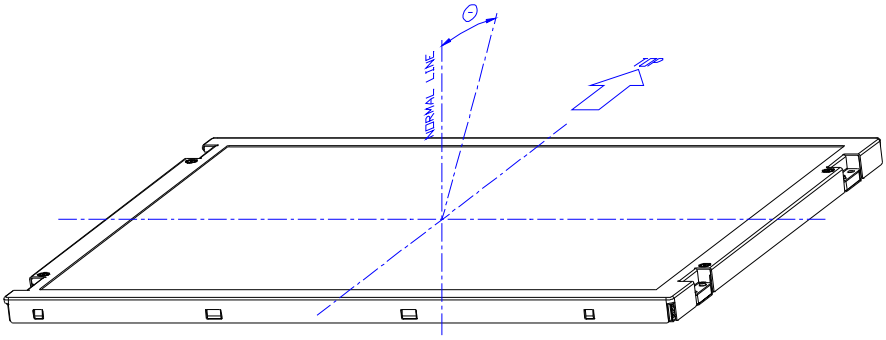
Note 3: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

Note 4: Driving conditions for CCFL: I_L= 12 mA, 50 KHz Frequency.

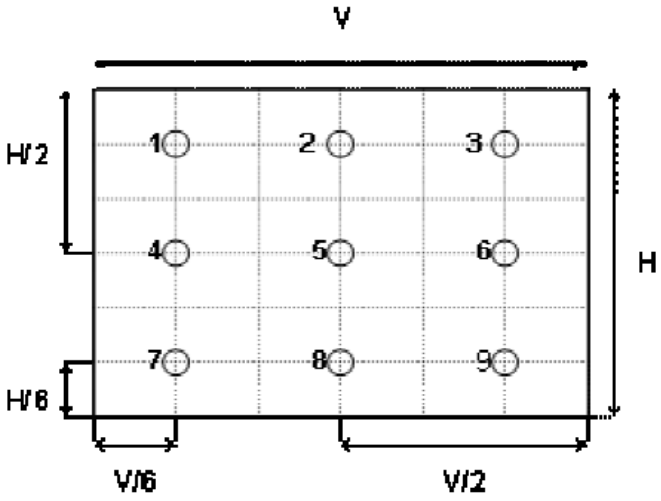
Note 5: Definition of viewing angle



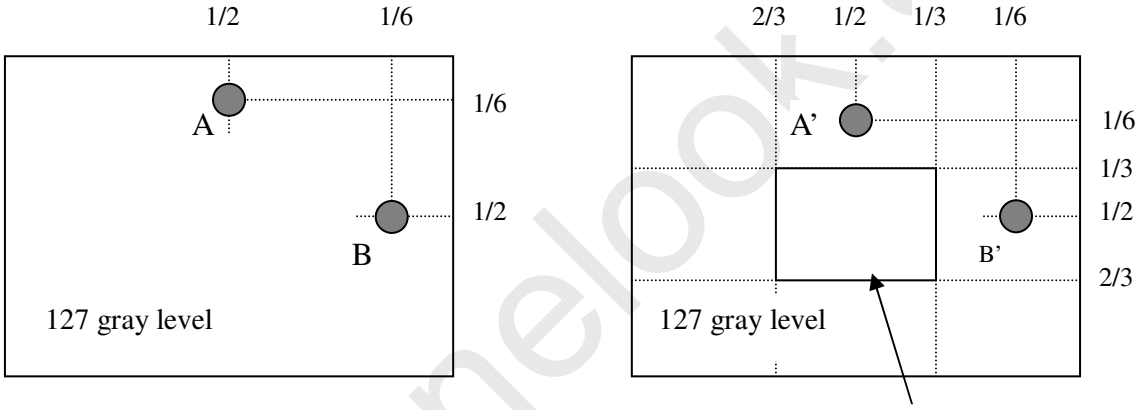
Note 6: Definition white uniformity:

Luminance are measured at the following nine points (P1~P9).

$$\delta_W = \frac{\text{Minimum Brightness of nine points (P1~P9).}}{\text{Maximum Brightness of nine points (P1~P9).}}$$



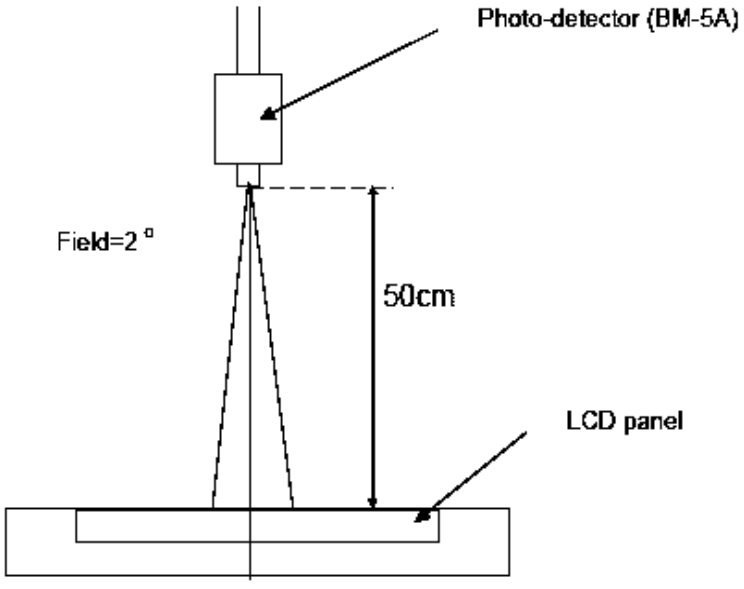
Note 7:



$I L_A-L_{A'} I / L_A \times 100\% = 2\%$ max., L_A and $L_{A'}$ are brightness at location A and A'

$I L_B-L_{B'} I / L_B \times 100\% = 2\%$ max., L_B and $L_{B'}$ are brightness at location B and B'

Note 10: Optical characteristic measurement setup.



E. Safety

(1) Sharp Edge Requirements

There will be no sharp edges or corners on the display assembly that could cause injury.

(2) Materials

a. Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible InnoLux Toxicologist.

b. Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process. The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

c. Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

F. Display quality

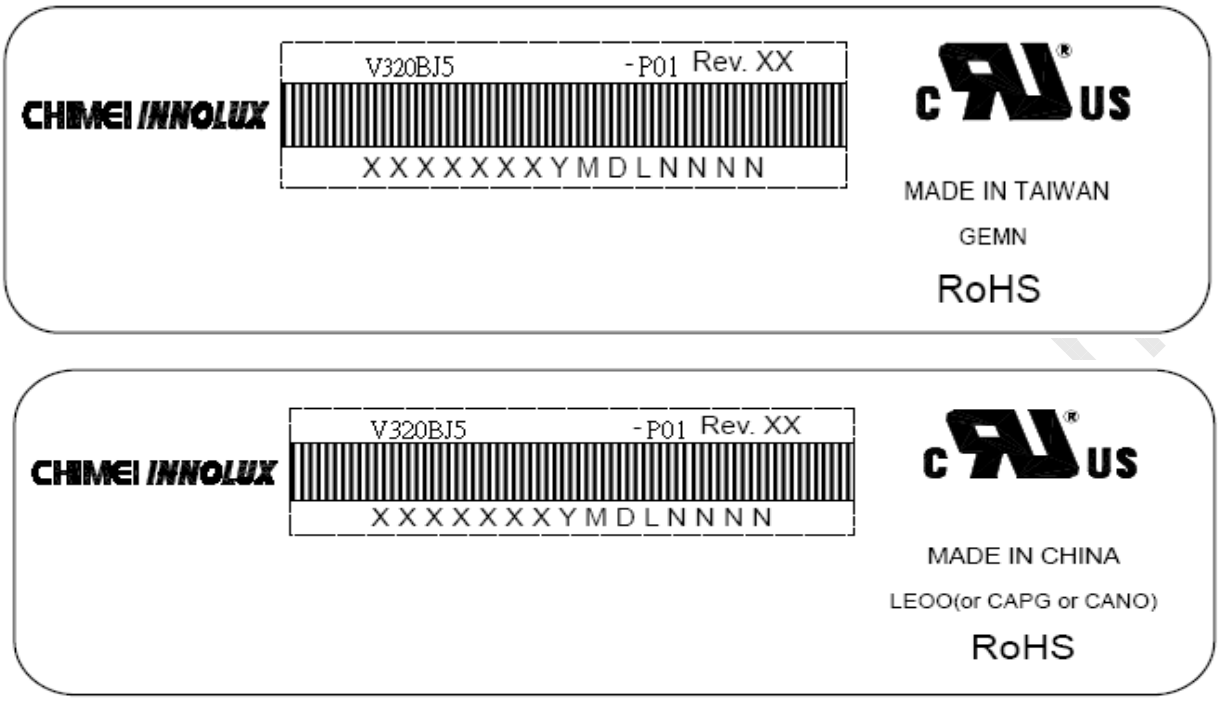
The display quality of the color TFT-LCD module should be in compliance with the Innolux's Incoming inspection standard.

G. Handling precaution

The Handling of the TFT-LCD should be in compliance with the Innolux's handling principle standard.

H. Label

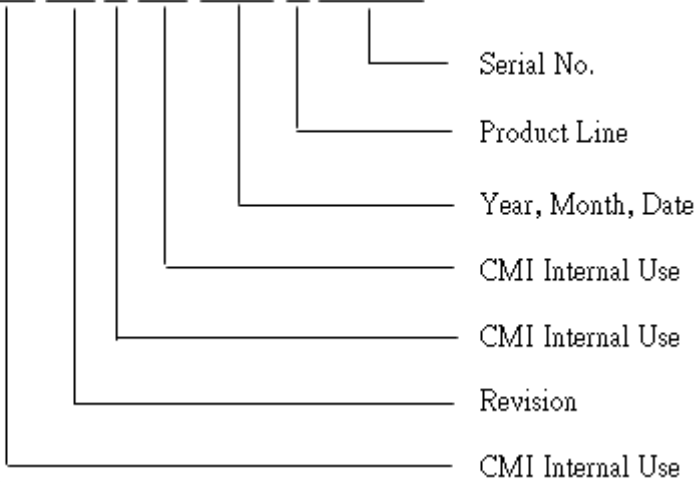
(1) Module Label



(a) Model Name: V320BJ5-P01

(b) Revision: Rev. XX, for example: A0, A1… B1, B2… or C1, C2…etc.

(c) Serial ID: X X X X X X Y M D L N N N N



Serial ID includes the information as below:

(a) Manufactured Date: Year: 0~9, for 2010~2019

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I ,O, and U.

(b) Revision Code: Cover all the change

(c) Serial No.: Manufacturing sequence of product

(d) Product Line: 1 -> Line1, 2 -> Line 2, …etc.

I. Packing specification

1. PACKAGING

1.1 PACKING SPECIFICATIONS

(1) 21 LCD TV Panels / 1 Box

(2) Box dimensions : 970 (L) X 640 (W) X 319 (H)

(3) Weight : approximately 38Kg (21 panels per box)

1.2 PACKING METHOD

Figures I-1 and I-2 are the packing method

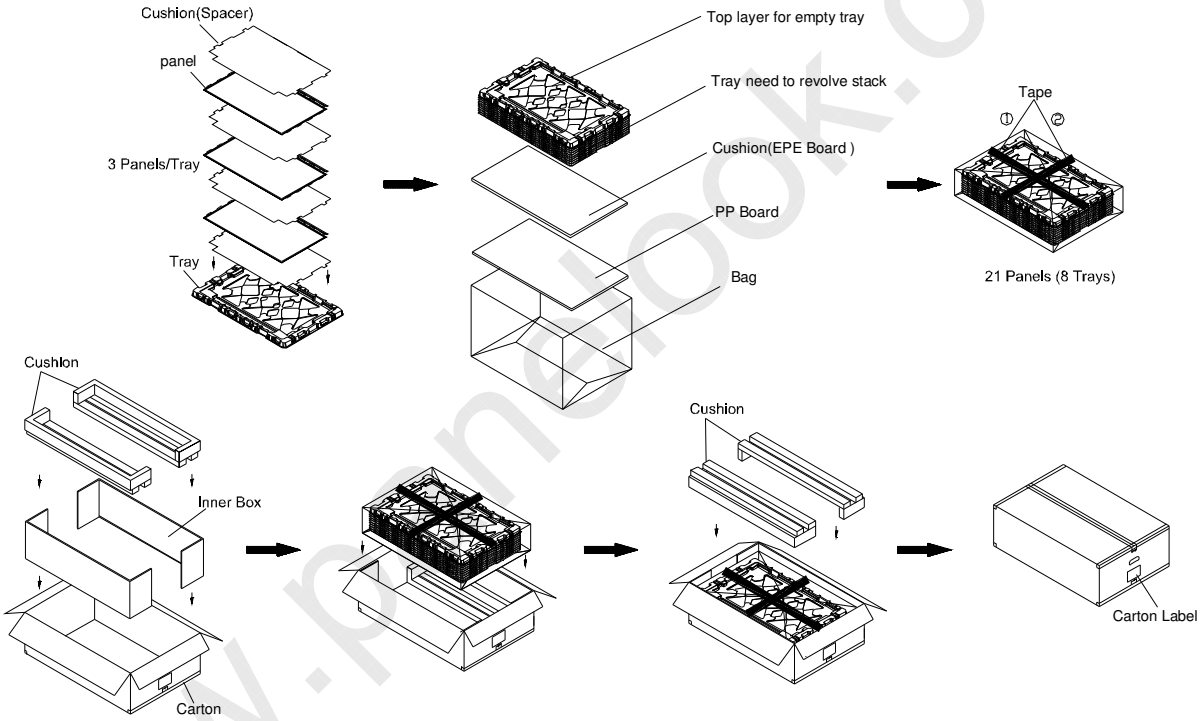
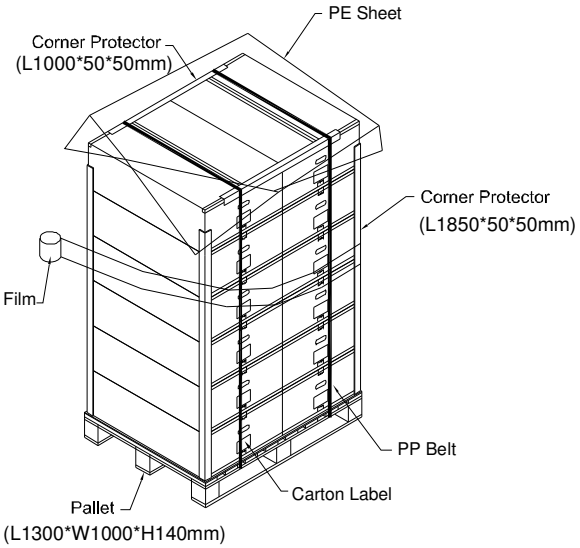


Figure.I-1 packing method

Sea & Land Transportation



Air Transportation

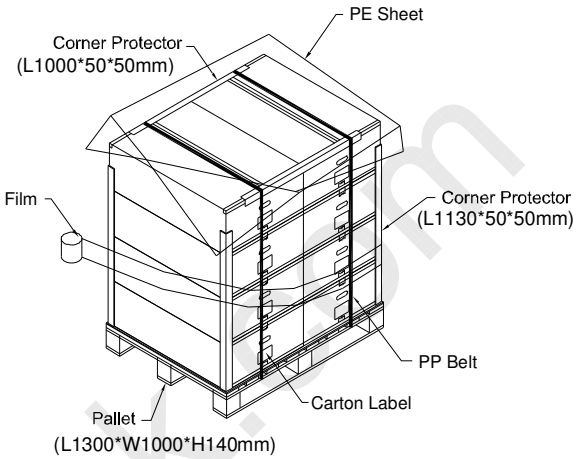


Figure.I-2 packing method

J. Mechanical drawing